La Sauvenière
MANAGIMM - MODULO architects, Belgium

Summary

La Sauvenière is a refurbishment of the energy installations in a collective housing complex. The new installation combines different renewable energy technologies with high efficiency. The project is a good example for multi-owner properties and authorities how to replace outdated installations in operation, by bio fuelled and solar based heat/power-production without disruption of occupancy. The project proves the feasibility of this kind of operation, the ecological benefits, the importance of support by local authorities and the need for a strong centralised lead by the promoter.

End-user area
- [ ] New buildings
- [x] Refurbishment of buildings
- [ ] Transport and mobility
- [ ] Financial instruments
- [ ] Industry
- [ ] Legal initiatives (regulations, directives, etc)
- [ ] Planning issues
- [ ] Sustainable communities
- [ ] User behaviour
- [ ] Education
- [ ] Other

Target Audience
- [ ] Citizens
- [ ] Households
- [x] Property owners
- [ ] Schools and universities
- [ ] Decision makers
- [x] Local and regional authorities
- [ ] Transport companies
- [ ] Utilities
- [ ] ESCOs
- [ ] Architects and engineers
- [ ] Financial institutions
- [ ] Other

Technical
- [x] Energy efficiency
- [x] Heating
- [ ] Cooling
- [ ] Appliances
- [ ] Lighting
- [x] CHP
- [ ] District Heating
- [x] Solar energy
- [x] Biomass
- [ ] Wind
- [ ] Geothermal
- [ ] Hydro power
- [x] Other

Context

La Sauvenière is a private housing complex in Brussels with about 350 apartments. The heating and hot water installation, dating from 1980, has been completely refurbished for being inefficient and outdated. A Combined Heat and Power installation has been installed, fuelled by vegetable oil. Moreover a large sun collector is being installed.

La Sauvenière, Chemin des Deux Maisons 61-85, 1200 Brussels

Objectives

The project aims at refurbishing the complete heat production with a centralised energy efficient biomass and solar based Combined Heat and Power installation. This new energy instalment is based on renewable energies and has high energy efficiency. La Sauvenière is being a quite large housing complex with hundreds of owners. The project has required a centralised production and cautious management of the process.

Process

The project has been initiated by the syndic of the housing complex, representing and managing the building complex. The end-users are the people living in the apartments, and the produced energy is used for heating, hot water production and for the electricity in the common parts of the building.

- A technological survey was conducted by a specialised energy consultant.
- Different contractor proposals were evaluated. The final choice had to be defended and approved by the board of owners.
- A building and environmental permit had to be introduced at the local authorities.
- Installation works are executed in different phases as to allow an uninterrupted service of the existing installation.
- The finalisation of the project includes a monitoring and evaluation of the overall installation.

Financial resources and partners

The total investment amounts to 490.000 EUR. The funding is reached through a private investment credit and subsidies of the different government levels (Commune Woluwe St Lambert, Brussels Region and Federal Government) of 130.000 EUR. The payback time is estimated at 3 to 4 years.

Results

1. Description of the bio-fuelled cogeneration system:

Electrical power	Thermic power	Investment
2 x 25kW	2 x 44kW	130.000€

Technical situation:

The 2 cogenerators are placed next to the 2 dismantled gas boilers, the 20.000 litres tank of vegetable oil is buried in the garden in front of the boiler local.


Mathematical illustration:

Daily water consumption:	25m³
Index:	1,16 (*)
Increase in degrees:	60°-10°=50°
Energy demand (kWh):	25m³ x 1,16 x 50° = 529.250 kWh/year
Energy demand incl. distribution losses, 30% (kWh):	756.071 kWh/year
Thermic power cogeneration:	2 x 44kW = 88kW
Hours needed:	756.071kWh / 88kW = 8.591 or 358 days
Electrical power cogeneration:	2 x 25kW = 50kW
Total electricity production:	8.591h x 50kW = 429.550kWh

(*) conversion factor between kcal (power needed to increase the temperature of 1L of water) and kWh

Financial Benefits:

Electricity

- 80% of the produced electricity is consumed internal
  343.640kWh x 0,12€/kWk = 41.237€
- The remaining 20% is sold to the distribution company
  68.728kWh x 0,04€/kWh = 2.749 EUR

Sub-Total (electricity) = 43.986 EUR

Gas reduction

The efficiency of the 25 years old gas boiler is approximately 60%

A yearly production of 1.260.118 kWh is then necessary to obtain the 756.071 kWh which is the energy demand for the hot water production.

Cost: 1.260.118kWh x 0,032 EUR/kWh = 40.324 EUR

Sub-Total (gas reduction) = 40.324 EUR

Green Certificates

One certificate for every 375 kWh produced with renewable energy resources.

429.550kWh / 375 = 1.145 certificates

Brussels marketprice January 2007 per certificate = 90 EUR

Sub-Total (green certificats) = 103.050 EUR

Sub-total (electricity) + Sub-total (gas reduction) + Sub-total (green certificates) = 187.365 EUR

Costs:

Cost for required amount of vegetable oil (rape): 75.000 EUR

Expected price: 70 EUR/m³ vegetable oil

Contractual maintenance costs expected: 13.500 EUR

Total costs: 88.500 EUR/year

Financial benefits
98.865 EUR/year

Environmental Benefits:

A cogeneration unit of 25 kW electrical power and 44 kW thermal power which are using vegetable oil consume 85 kWh per hour (electrical yield of 30% and thermic yield of 52%).

The estimated coefficient of CO_2 emissions is 65 kg/kWh with vegetable oil, and 217 kg/kWh with natural gas.

The CO_2 emissions from the cogeneration unit is then 5.525 kg (85 kWh x 65 kg/kWh)

CO_2 emission from a reference electric power station with the production of an equal quantity of electricity is 9.863kg ((25/0.55) x 217)

CO_2 emissions from a reference thermal power station with the production of an equal quantity of heat is 10.608 kg ((44/0.99) x 217)

Total amount of CO_2 emissions from a reference power station = 20.471kg

Relative economy of gas emission:

(20.471 – 5.525)/20.471 = 73%

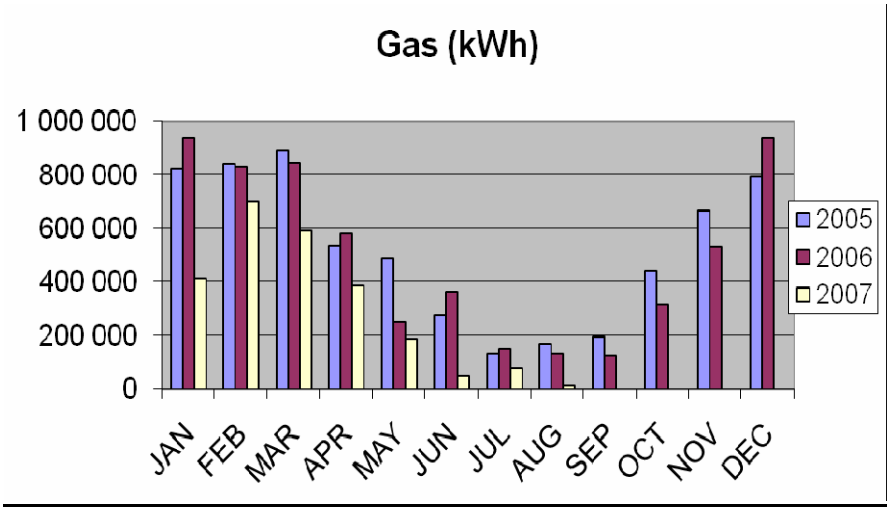
Environmental benefits
A reduction of the CO_2 emission with 73%, or 222,6T/year is estimated with the new bio-fuelled cogeneration boiler in operation

2. Description solar system:

Dimensions of solar system	
Total surface of solar captors	250m²
Stockage volume of water	12.000 litres
Energetic balance sheet	
Annual economy of gas	188.000 kWh
Percentage economy of gas	18%
Economical balance sheet without subsidies	
Cost of system (VAT incl)	178.000 EUR
Annual economy	6.815 EUR
Cost per kWh economized	4,0 cEUR/kWh
Economical balance sheet with subsidies	
Cost of system (VAT incl)	105.000 EUR
Cost per kWh economized	2,0 cEUR/kWh
Economical balance sheet per appartment	249 EUR (VAT incl)
Environmental balance sheet	
CO_2 emissions avoided (T/year)	40T
CO_2 emissions avoided during expected life time of installation	1.000T

Technical situation:

The 250 m² are placed on the roofs of buildings 71 and 69, this last one is situated vertically above the central heating station.



The amount of gas used for heat production is now (2007) on a much lower level than for the same periods 2005 and 2006, see graph above. In only 6 months time approximately 1.500.000 kWh of the annual consumption of gas has been saved.

The results have been so good that Managimm now is calculating to install another 700 kW (thermic power) heat power machine functioning with vegetable oil in order to be able to heat the building in winter period!

Meetings and visits held:

Start	Batibouw 2005 – Brussels – Expo 12 : Renawable Energies
9/11/2005	Visit Wagner&Co Solartechnik - Germany
20/1/2006	Seminar IBGE : Les énergies renouvelables pour des grands systèmes
1/2/2006	Technological survey by specialised energy consultant
24/2/2006	Visit IBGE : Maison de Repos ARCADIA - Audit Energétique
3/3/2006	Batibouw 2006 – Brussels – Expo 12 : Renewable Energies
26/4/2006	Results of technological survey
27/4/2006	First presentation to General Assembly
17/5/2006	Technological survey Heat and Power Station – IBGE – cogeneration
24/5/2006	Visit on sites using renewable energies with IBGE
6/6/2006	Information evening at the Commune Renewable Energies
12/6/2006	Visit with Cogenco installation at La Glanerie (Tournai) : cogeneration
16/6/2006	Visit Salon des Energies Renouvelables - Versailles (Paris) – France
23/6/2006	Seminar IBGE : energy savings …
28/6/2006	Meeting Energy Consultants : combination solar system with cogeneration
3/7/2006	Visit ESE – Rochefort – Belgium
17/8/2006	Visit Töffl & Schwarz – Austria
18/8/2006	Meeting Electrabel : cogénération
25/8/2006	Visit on site Wagner & Co : solar system
29/8/2006	Visit ESE on site : solar system

2/9/2006	Visite Sanutal on site : solar system
5/9/2006	General Assembly : 97% vote in favour of investments renewable energies
28/9/2006	Visit on site Wagner & Co : visit solar system
4/10/2006	Visit ESE on site : solar system
5/10/2006	Seminar Electrabel : Central Heating Management
17/10/2006	Seminar IBGE : cogeneration
17/10/2006	Visit on site Cogenco : tank 20.000L
18/10/2006	Visit ESE : swimming pool St Gilles Victor Bouain 184m² solar panels
26/10/2006	Visit ESE – Rochefort – Belgium
27/11/2006	Start placement new electrical distribution
1/12/2006	Placement 20.000L tank vegetable oil
5/12/2006	Placement new Power Station 800kW Viessmann
	Seminar IBGE : european energy directive
16/1/2007	Visite on site ESE – technical solutions for placement
19/1/2007	18.000L of vegetable oil on site !
31/1/2007	Complete replacement of outdated lighting system in parkings
1/2/2007	First article in national newspaper ECHO
1/2/2007	Seminar IBGE : energetic maintenance
1/2/2007	National action participation : 7.55PM all common lights off for 5 minutes…
16/2/2007	Introduction Building and Environmental Permit
20/2/2007	Visit ESE on site : hydrolique analysis
22/2/2007	Visit Batibouw 2007 – Brussels – expo 12 : Renewable Energies
23/2/2007	Visit Cogengreen : technical analysis for placement

Lessons learned and repeatability

Every Large scale existing housing complex has its own characteristics with different kind of ownership, management, energy production technologies etc. This project is a good example showing how an investment in renewable energy in existing large scale housing complexes can be both economic and ecologic sustainable.

Although the financial support by local authorities is very important, the administrative support is unavoidable.

In order to spread out the experience to a large public, Managimm participate to all seminaries organized by the Brussels Regional Administration for the Environment (IBGE) and organize information evenings on site. The environmental concerns are nowadays really important in the European society and therefore these kind of renewable energy actions are very important to raise public awareness.

We are convinced that a general thought about the working of the heating station in most of the buildings already could result in a decrease of fuel consumption and air pollution, and this without any investment.

Presenting our experiences in several other buildings, we are always confronted with two major obstacles:

1. The amounts to be invested
2. The uncertainty from the building managers of the building about this new technique and if the required amount of work now will be higher than before.

Contact for more information:

Organisation / Agency:	MANAGIMM	MODULO architects
Main contact	V. Spruytte	D. Holemans
Address:	Tweehuizenweg 71/5	Tweehuizenweg 69/5
	1200 BRUSSELS	1200 BRUSSELS
	BELGIUM	BELGIUM
Tel:	+32 2 771 01 95	+32 2 776 81 00
Fax:	+32 2 771 00 15	+32 2 776 81 09
E-mail:	info@managimm.com	info@modulo-architects.be
Web Site:	www.managimm.com	www.modulo-architects.be

Printed reports or other literature available:

Title: Energies Renouvelables ; Un projet qui combine cogénération et panneaux solaires. Une copropriété modèle à Woluwé. L'Echo, 1/2/2006, p13